99D127

CALFED PSP COVER SHEET

PROPOSAL TITLE: THE EFFICACY OF PUBLIC EDUCATION PROGRAMS IN REDUCING AQUATIC TOXICITY FROM STORMWATER RUNOFF
APPLICANT NAME: SAN FRANCISCO BAYKEEPER
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AMOUNT OF FUNDING REQUESTED: $ $1,673,257 for 3 years (see DeltaKeeper proposal #2 for reduced scope project).

Indicate the topic for which you are applying (check only one box)

__ Fish Passage/Fish Screens
__ Habitat Restoration
__ Local Watershed Stewardship
X Water Quality
___Introduced Species
___ Fish Management/Hatchery
___Environmental Education

Does the proposal address a specified Focused Action? ____ yes ____ no
What county or counties is the project located in? San Joaquin County

Indicate the geographic area of your proposal (check only one box):

__ Sacramento River Mainstem
__ Sacramento Trib: _____
__ San Joaquin River Mainstem
__ San Joaquin Trib: _____
_X Delta: _City of Stockton Sloughs____
___ East Side Tributary:_____
___ Suisun Marsh and Bay
___ North Bay/South Bay
___ Landscape (entire Bay/Delta Watershed)
___ Other _____

Indicate the primary species which the proposal addresses (check all that apply)

X_ San Joaquin and East-side Delta tributaries fall-run chinook salmon
__ Winter run chinook salmon
__ Late fall run chinook salmon
X Delta smelt
X Splittail
__ Green sturgeon
__ Migratory birds
__ Spring-run chinook salmon
__ Fall-run chinook salmon
__ Longfin smelt
__ Steelhead trout
X__ Striped bass
X__ All chinook species
X Other: Aquatic Life Resources for above species X__ All anadromous salmonids

Specify the ERP strategic objective and target(s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II: Objectives of Water Quality Program Plan p. 5-6,7 Jan. 99: Develop comprehensive pesticide program, two-pronged approach to pesticides (esp. chlorpyrifos and diazinon) includes monitoring to verify toxicity, establish use patterns, develop public education programs, evaluate implementation of MP's and monitoring water quality to achieve targets.

EXECUTIVE SUMMARY

This proposal outlines a collaborative project designed to evaluate the efficacy of public education as an effective approach for controlling pesticide impacts, focusing on urban residential aquatic life toxicity caused by organophosphate pesticides contained in stormwater runoff. The geographic region for this test project will be Stockton's Delta tidal backwater sloughs which provide significant habitat for fish and other aquatic life and which now receive high levels of toxicity associated with stormwater runoff events from city stormwater discharges. Aquatic life toxicity (ALT) in urban stormwater runoff (USR) is due primarily to residential use of diazinon and chlorpyrifos (D&C) for termite and ant structural pest control, and lawn and garden pest control. This project focuses on the development of an intensive residential public education program within selected areas of Stockton which will encourage public reductions in the use of OP pesticides (OPP) on residential properties, thus reducing the amount of OP pesticides present in urban stormwater runoff. The effectiveness of the public education practices utilized in this project will be evaluated through stormwater runoff and receiving water monitoring to determine the level of toxicity present and to evaluate changes in pesticide use practices associated with knowledge gained from this program.

DeltaKeeper (San Francisco BayKeeper), will mount a public education campaign to evaluate current levels of local pesticide use in a variety of seasons, public levels of knowledge about pesticide impacts, and current application practices. Initial assessment will be done through surveys in target areas. Then, using a variety of media, including PSA's, bus placards, mailings, flyers, the DK website, and other venues, DeltaKeeper will mount an education campaign designed to create broader awareness of the over-use of pesticides and the availability of viable alternatives which can reduce toxic impacts to aquatic life. Since actual impacts of public education efforts on toxicity reduction have received little attention, DeltaKeeper will evaluate actual changes effected through its campaign by revisiting target neighborhoods where initial surveys were conducted and conducting a follow-up survey to assess a) public impact of various methods used (i.e. which ones are reaching homeowners and how often), b) changes in application practices resulting from new knowledge or awareness, and c) changes in product use practices.

A key component of this project will be establishment of current baseline conditions for amounts of OPP present in USR in selected residential areas of Stockton. Drs. G. Fred Lee and Anne Jones-Lee of G. Fred Lee & Assoc, El Macero, CA, with the assistance of Scott Taylor of Robert Bein, William Frost & Assoc (RBF), Irvine, CA, will design, implement and report on a stormwater runoff and receiving water monitoring program. DeltaKeeper staff will collect USR and non-runoff waters discharged to and present in Mosher Slough and Smith Canal to establish: 1) the amounts of OPP-caused and total toxicity in Stockton USR prior to implementing the education program, 2) the sources of OPP in USR, specifically types of urban residential use, such as lawn and garden pest control, termite and ant control, etc., 3) the chemicals responsible for Stockton USR aquatic life toxicity, and 4) the efficacy of the education-based control program on reducing toxicity and OPP concentrations in USR and city of Stockton receiving

waters.

Further, in a cooperative effort between Jim Harrington, Bioassessment Program of the California Department of Fish and Game, Tom King of the Central Valley Regional Water Quality Control Board, and the water quality monitoring program conducted by Drs. Lee and Jones-Lee, this project will provide information on the impact of Stockton OPP USR ALT on eastern Delta aquatic life resources. Of particular importance will be an assessment of improvements in aquatic life resource populations and health as a result of intensive public education and any resultant reduced toxicity in USR as local pesticide application and use practices change. All toxicity testing will be done by the Unversity of California Davis Aquatic Toxicology Laboratory (UCD ATL) in Davis, California. This laboratory has been involved with the CVRWQCB and DeltaKeeper in studies of Stockton USR ALT since 1994. Dr. Lee has also worked with this laboratory in connection with OPP ALT studies conducted over the past three years in Orange County, CA. The UCD ATL is uniquely qualified to conduct testing and was approved as a key collaborator for the DeltaKeeper Delta Toxicity Monitoring Project currently underway under a CALFED contract.

The proposed *Efficacy of Public Education* project will provide urgently-needed information for the management of water quality in the eastern part of the Delta. It will strongly complement the CALFED Focused Actions intended to improve water quality in the eastern Delta by establishing both data and recommendations on means of control for use of pesticides in urban areas. It will also provide highly important information under the CALFED Environmental Education area of interest, by demonstrating the potential efficacy of environmental education as an effective tool for control of ALT, by evaluating specific sources which can be reduced, and by determining the best means of creating public awareness and use reductions. Such data will help to focus future expenditures on public education measures so that dollars can be spent most productively.

Project contracts and reporting will be managed by San Francisco BayKeeper, the parent for DeltaKeeper. Collaborators for this project will include DeltaKeeper Bill Jennings, currently conducting a CALFED Delta Toxicity project jointly with UCD ATL. BayKeeper and DeltaKeeper have been widely recognized for their water quality achievements during the last ten years by the US EPA, the Management Center, the United Nations Environmental Programme, Renew America and in 1997 by Friends of the Estuary as one of the Top Ten Organizations implementing the Comprehensive Conservation Management Plan for San Francisco Bay. Key collaborators will be the UCD ATL; Jim Harrington, of the CA DFG Aquatic Bioassessment Laboratory; Tom King and Dr. Val Connor, CVRWQCB; Drs. Lee and Jones-Lee of G. Fred Lee & Assoc, El Macero, CA; and Scott Taylor, RBF, Irvine, CA.

This project furthers CALFED water quality objectives by exploring a specific problem of pesticide transport and impact (baseline data on ALT). It provides an implementation mechanism by testing reduction measures designed to reduce current toxicity. In addition, the proposal furthers the objectives of the environmental education focus by testing the relationship between education and action in order to determine specific vehicles for effectively creating awareness and overall impacts of public education projects such as this one in reducing use and misuse of pesticides such as diazinon and chlorpyrifos.

PROJECT DESCRIPTION

Background. The fisheries-related aquatic resources of the Delta are being adversely affected by toxic pulses of organophosphate pesticides used in agricultural and urban areas which are carried to waterways through stormwater runoff. Beginning in 1994, the CVRWQCB (Dr. Val Connor) initiated USR monitoring of ALT in Stockton. For the last three years, DeltaKeeper and the city of Stockton have independently conducted ALT monitoring of Stockton sloughs during USR events. These monitoring studies show that Stockton area Delta tidal backwater sloughs become toxic to *Ceriodaphnia* (zooplankton) with each runoff event. This toxicity is of sufficient magnitude and duration to adversely effect zooplankton populations and benthic invertebrates sufficiently to be adverse to survival of larval fish populations within the eastern Delta.

The current pesticide use regulations, as well as the SWRCB-Department of Pesticide Regulation (DPR) Management Agency Agreement (MAA) covering the California Pesticide Management Plan for Water Quality of February 1997 initially focuses on education of pesticide users, positing that education on appropriate use to minimize pesticide runoff to water courses will alleviate ALT. While DPR and pesticide registrants are working with agricultural interests in an effort to enhance voluntary control of OPP use, there is no similar program being conducted in urban areas that is directed toward impacting Delta water quality.

The proposed Efficacy of Public Education Project will a) establish baseline information on ALT in order to evaluate reductions after public education efforts take place with residential users, b) mount an intensive public education program to provide residential users with information on appropriate use of pesticides and alternatives, and c) conduct monitoring and follow-up surveys to determine the efficacy of the public education components and their potential impact on pesticide management and toxicity reduction in USR, thus benefitting water quality and aquatic life resources. Residents of selected areas of Stockton will be educated about appropriate applications of OPP for a variety of uses in and around their homes and about alternatives and management practices which can eliminate or reduce a significant portion of the OPP-caused ALT in USR.

SCOPE OF WORK - MAJOR TASKS SUMMARY:

Task 1- Establish baseline information on OPP (D&C) concentrations and ALT in Stockton USR to Mosher Slough and Smith Canal concurrently with design of public education program, Task 2, and develop information on the existing aquatic life resource impacts of the current OPP-caused toxicity, Task 4. Task 1 will also collect baseline data on reductions in OPP runoff after public education program implementation, and document improvements in aquatic life resource conditions in Stockton sloughs and nearby Delta waters that accrue through residential OPP public

education/control program in Task 2.

Task 2 - Design and implement a public education program on appropriate residential use of OPP (and/or alternatives) to reduce/eliminate toxicity in USR and prevent ALT (includes evaluation of current practices and post-education program modifications);

Task 3 - Bioassessment of existing OPP impacts on aquatic life and changes in populations that are potentially caused by OPP ALT will be evaluated over the course of the 3-year project.

TASK 1 ACTIVITIES: OP PESTICIDE AND AQUATIC LIFE TOXICITY BASELINE INFORMATION STUDY: Recently, Drs. Lee and Jones-Lee (1999) conducted a comprehensive review of the existing published and substantial unpublished UCD-ATL Stockton stormwater runoff OPP D&C concentration and ALT data. While there is substantial information that demonstrates that USR in Stockton (like USR in the San Francisco Bay region, Sacramento, Orange County, CA, Los Angeles, and San Diego) contains sufficient diazinon and, in most cases, chlorpyrifos to be acutely toxic to *Ceriodaphnia* typically within one to two days, there is need to initiate an expanded USR and Stockton slough monitoring program to establish current OPP concentrations and ALT in USR from a wider range of selected areas of Stockton. This expanded study, as outlined in this proposal, will be used as a baseline from which an evaluation can be made on the efficacy of the proposed public education program (Task 2) in controlling both OPP concentrations and ALT. The monitoring program will be coordinated with sites where intensive public education occurs. Details are provided in the Monitoring and Data Collection Methodology section of this proposal.

TASK 2: EVALUATION OF PUBLIC PRACTICES FOR OPP USE IN THE STOCKTON URBAN REGION, AND PUBLIC EDUCATION CAMPAIGN TO REDUCE OPP RUNOFF IN USR: Concurrently, with OPP D&C concentrations and ALT evaluation, DeltaKeeper will mount a public education campaign which will evaluate current levels of local seasonal pesticide use, public levels of knowledge about pesticide impacts, and current application practices. Initial assessment will be done through door-to-door and telephone surveys in specific target regions. Through use of a variety of media, including PSA's, (possibly bus placards or shelter ads), mailings, flyers, the DeltaKeeper website, and other venues, DeltaKeeper will mount a public education campaign designed to create a broader awareness of the over-use of pesticides and the availability of viable alternatives which can reduce toxic impacts on aquatic life. Since the actual impacts of public education efforts on toxicity reduction have received little attention, DeltaKeeper will evaluate actual changes effected through its public awareness campaign by revisiting target neighborhoods where initial surveys were conducted and by conducting a follow-up survey which will assess a) public impact of various methods used (i.e. which ones are reaching home and business

owners and how often), b) changes in application practices which have resulted from new knowledge or awarness, and c) changes in product use practices which have resulted from the public education program.

TASK 3: IMPACT OF OPP ALT ON DELTA AQUATIC LIFE RESOURCES: As discussed by Lee *et al.* (1999a), the approach that will be recommended to regulate ALT caused by OPP is uncertain. The regulatory approach can range from the CVRWQCB Basin Plan objective of no toxics in toxic amounts through demonstrating that OPP-caused ALT is or is not having a significant adverse impact on the beneficial uses of the waterbodies potentially impacted. The latter approach is mandated by the US EPA Office of Pesticide Programs and state of California DPR regulations. Several pesticide registrant-sponsored reports (Novartis, 1997; Giesy *et al.*, 1999) developed by university and private study groups assert that the *Ceriodaphnia* toxicity caused by D&C, as measured under laboratory conditions, does not represent a significant adverse impact on the beneficial uses of the waters that were sampled in those studies.

Under the proposed DeltaKeeper project, Jim Harrington of the CA DFG, Aquatic Bioassessment Laboratory will initiate a study to provide information needed for appropriate regulation of OPP-caused ALT in Stockton sloughs and the Delta receiving waters. The study will examine the receiving water aquatic life resources for evidence of adverse impacts. It will be coordinated with the CVRWQCB's interests by Tom King, now of the CVRWQCB staff, but formerly with the CA DFG Aquatic Bioassessment Laboratory.

Delta tidal backwater sloughs located within Stockton have been found to be toxic to *Ceriodaphnia* during USR events. This toxicity is due to the OPP D&C. However, it is not known if these pesticides are causing *in situ* biological effects. Task 3 is proposed to provide a link between laboratory-derived chemical and toxicological data and the *in situ* biotic community. A by-product of Task 3 is that the results will provide crucial biological information for these impacted waterbodies that may be used in future monitoring efforts for evaluating restoration activities.

Dr. Lee will work closely with Mr. Harrington, providing chemical and toxicological information about the toxic plumes that are generated by USR discharged to Mosher Slough and Smith Canal. Mr. Taylor will assist Dr. Lee in plume tracking and mixing in receiving waters for the USR. Drs. Lee and Jones-Lee are familiar with bioassessment techniques, especially as related to water pollution control-related issues, where they (Lee and Jones, 1982) have published guidance on how to use this approach in water quality investigations/management.

The bioassessment study will run throughout the three year life of the project to determine toxicity and document improvements which may be related to OPP

reduction in USR. A report will be generated to summarize methods, results and conclusions that will be incorporated into a final comprehensive project report.

Project Coordination. The components of this project will be coordinated by Bill Jennings of the DeltaKeeper (Public Education), Jim Harrington, Tom King (Bioassessment of Impacts), and G. Fred Lee (OPP Concentrations and Fate and ALT). Drs. Lee and Jones-Lee will provide technical leadership for the overall project, where they will have the responsibility for coordinating and developing interim and final reports. Dr. Lee has been serving as a technical advisor to the DeltaKeeper for several years.

Location and/or Geographic Boundaries of the Project. City of Stockton Delta Tidal Backwater Sloughs in San Joaquin County.

ECOLOGICAL/BIOLOGICAL BENEFITS

Ecological/Biological Objectives. The primary ecological/biological benefits of this project are directed toward developing urban OPP-caused ALT management programs that can protect the beneficial uses of waterbodies receiving USR and still allow the appropriate use of pesticides. Public education is generally recognized as the first step in developing a management program. If it should be learned through this project that public education is not effective in controlling OPP ALT, which may be the case, then restrictions on the use of the pesticides will likely have to be implemented.

Another ecological/biological benefit of this project, specifically of Task 3, is that *in situ* biological data are more likely to stimulate community interest than the more abstract chemical and toxicity-based data. Stimulating community interest in local biological resources may help assure a more successful implementation of control programs and management practices for reducing urban pesticide runoff. Other ecological/biological benefits include:

1. establishing a taxonomic list of aquatic invertebrates and associated biological metrics within the project area that may be used as background for future biological monitoring,
2. documenting the temporal and spatial variability of benthic macroinvertebrates and zooplankton within the project area, and
3. evaluating the association between pulses of USR ALT and invertebrate community structure along a contaminant concentration gradient.

The biological resource assessment designed for this project follows recommendations in the CALFED Comprehensive Monitoring, Assessment and Research Program (CMARP) proposal. The CMARP document outlines the use of benthic macroinvertebrate and

zooplankton communities for addressing several of its monitoring goals and objectives. CMARP divides the monitoring of benthic macroinvertebrate communities into three major components. 1) using benthic macroinvertebrate communities as an assessment tool to help CALFED prioritize watershed improvement projects, evaluate project success and measure long-term trends in water resource condition; 2) measure quantity and quality of benthic macroinvertebrates as a source of food for aquatic, riparian and terrestrial organisms; and 3) conduct surveys to improve knowledge on benthic macroinvertebrate taxonomy and distribution, and to further establish relationships between benthic macroinvertebrates and human disturbances. A by-product of the bioassessment study is that the results will provide crucial biological information for these impacted waterbodies that may be used in future monitoring efforts for evaluating restoration activities.

Linkages: This project will fill an important information gap that now exists in the CALFED OPP management program. The direct discharges of USR associated OPP-caused ALT into Delta waters within the city of Stockton sloughs represents a significant threat to key components of the Delta aquatic ecosystem that should be controlled to the extent possible through public education on pesticide use.

This component of this project is an expansion of the OPP studies that Dr. Lee and Mr. Taylor have been conducting in Orange County, CA over the past three years. That project is conducted in association with the Santa Ana Regional Water Quality Control Board where the data that have been, and continue to be, developed will serve as the basis for developing TMDLs for OPP ALT, and D&C. Dr. Lee and Mr. Taylor are responsible for providing technical leadership for the Orange County Upper Newport Bay project. They have recently completed a 210-page project report (Lee *et al.*, 1999b) covering the Upper Newport Bay watershed studies. The Upper Newport Bay watershed OPP ALT studies being conducted under Dr. Lee's supervision are developing information needed to develop technically valid, cost-effective OPP management programs.

While, under Dr. Lee's supervision, a similar type of project is underway in the Orange County, CA watershed, that project will not duplicate this proposed project. That project does not have the strong public education component of this project. Further, the receiving water impacts of the USR are manifested in impacts on marine organisms rather than fresh water organisms. The fate and persistence and impacts of OPP associated ALT in the marine environment will be significantly different than in the eastern part of the Delta.

Dr. Lee has been an active participant in the Urban Pesticide Committee and can serve as liaison between this project and that committee. In addition, he has recently been asked to serve as a member of the CALFED-sponsored advisory panel for the city of Sacramento OPP study. In this capacity he will be able to coordinate the work that is being done in that study with this project.

This project will also help improve understanding of the processes that may contribute to, and impacts of, low dissolved oxygen levels in the lower San Joaquin River near Stockton. Low dissolved oxygen in the lower river has been a long-term water quality problem and is described by CALFED as a Focused Action for Category III funding. As part of this proposed project, we will be monitoring dissolved oxygen and measuring constituents within the backwater sloughs that may contribute to oxygen demand in the ship channel.

TECHNICAL FEASIBILITY AND TIMING

All of the procedures needed to successfully conduct the proposed project are well established in the Orange County project, as well as the existing DeltaKeeper UCD-ATL city of Stockton Delta Toxicity monitoring programs, where the QA/QC procedures have been approved by the State and Regional Boards. The OPP toxicity and chemical analysis will be conducted by the UCD ATL using standard US EPA procedures (Lewis *et al.*, 1994). Dr. Lee has worked with this laboratory over the past three years in the Orange County studies.

The focal point of the study program in the city of Stockton will be Mosher Slough and Smith Canal. Mosher Slough has a substantial USR existing aquatic toxicity database dating to 1994. During low intensity precipitation events it is impacted only by Stockton USR. During high intensity precipitation events it also receives drainage from upstream agricultural sources.

Smith Canal was selected since its headwaters are USR from the city of Stockton. There is no agricultural stormwater runoff input to this waterbody. Smith Canal, like other Stockton sloughs, is experiencing low dissolved oxygen problems. It is possible that the low DO and OPP toxicity combine to make the OPP ALT adverse to a greater array of organism types than occurs with just OPP ALT alone.

In order to assess the changes in the OPP and ALT loads to and concentrations within the selected waterbodies as a result of the public education program it will be necessary to follow a more detailed sampling program than is typically used in USR ALT monitoring programs. A summary of the monitoring to be conducted in this project is presented in Table 2. A detailed discussion of the sampling plan is available upon request.

MONITORING AND DATA COLLECTION METHODOLOGY

Overview of Aquatic Life Toxicity Chemical Characteristics Studies

In order to assess the benefits of public education on appropriate residential pesticide use, a comprehensive monitoring program will be implemented to determine 1) the uses of OPP on residential properties that lead to ALT in USR; 2) the amounts of OPP D&C

derived from residential areas that are discharged by a storm sewer to a Stockton waterbody before and after the implementation of a public education program; 3) the magnitude of the toxicity and its duration within the Stockton tidal Delta backwater sloughs, and 4) in conjunction with the bioassessment studies, the impact of the OPP-caused toxicity in the Stockton sloughs and nearby Delta waters on the aquatic life resources of these areas. A summary of the ALT study program for each of these areas is provided below.

Storm Sewer Discharges of OPP-Caused ALT and D&C. A monitoring program will be conducted to determine the amounts of ALT and the D&C discharged to Mosher Slough and Smith Canal from selected residential areas. Storm sewer discharge points will be monitored during several runoff events to determine the total amount of ATL and D&C discharged during the runoff event. USR ALT and D&C export coefficients for specific types of land use will be developed. This study will provide the before and after ALT and D&C export from a residential area as influenced by a pesticide use education program in that area.

Relationship between Pesticide Use and Stormwater Export. Monitoring studies will be conducted on several residential properties to determine how pesticide use on the property influences the export of ALT and D&C during stormwater runoff events and irrigation fugitive water releases.

Impact of USR on ALT and D&C in Stockton Waterbodies. The magnitude and duration of ALT and D&C concentrations will be determined in several Stockton sloughs during several USR events. Studies will also be conducted during dry weather conditions to assess the non-stormwater runoff related ALT and D&C.

Fate and Persistence of ALT and D&C. In support of the bioassessment studies, the magnitude, areal extent and persistence of ALT and D&C will be determined in several USR event associated plumes in the nearby Delta waters.

Miscellaneous Chemical Studies. Toxicity investigation evaluations will be conducted to determine the cause of the ALT and the role of D&C as a cause. Also, the potential significance of upstream of Stockton agricultural activities as a source of ALT and D&C will be assessed during USR events and dry weather flow.

Local Involvement

DeltaKeeper works routinely with state, federal and local agencies such as the Central Valley Regional Water Quality Control Board, City of Stockton agencies, Placer County Resource Conservation District, nonprofits such as the Audubon Socity and coalitions such as the Sacramento Watershed Protection Program. Project advisors include faculty members at University of the Pacific,

University of California at Davis and University of California at Berkeley, as well as Delta College in Stockton. DeltaKeeper also conducts volunteer training of local citizens who will be engaged in this project as feasible (i.e. assisting with monitoring and survey administration for the public education component). DeltaKeeper will work collaboratively with the City of Stockton and the California Department of Pesticide Regulation as well as the Urban Pesticide Committee on this project.

Conflict of Interest: None of the parties engaged in this project has any conflict of interest in its relationships with CalFed.

Table 2. Monitoring and Data Collection Information

Hypothesis/ Question to be Evaluated	Monitoring Parameters(s) and Data Collection Approach	Data Evaluation Approach	Comments/Data Priority
A. Characterize Stockton stormwater runoff	Grab samples during stormwater runoff events of Stockton storm sewer discharges will be analyzed for aquatic life toxicity (Ceriodaphnia}. fathead minnow larvae, and the alga Selenastrum} and the OP pesticides diazinon and chlorpyrifos. 72 samples will be collected per year for six stormwater runoff events, i.e., two per fall, winter, spring quarter.	The concentrations and loads of aquatic life toxicity to Ceriodaphnia and diazinon and chlorpyrifos discharged to Mosher Slough and Smith Canal will be determined. Toxicity unit and OP pesticide export coefficients will be developed for the types of land use served by the storm sewer discharges sampled.	High priority - essential to establish impact of public education on pesticide export from urban areas.
Characterize Mosher Slough and Smith Canal water quality during wet weather.	Grab samples will be obtained from selected locations from Mosher Slough and Smith Canal during stormwater runoff events to determine magnitude of aquatic life toxicity and OP pe sticide concentrations. Measurements will also be made of dissolved oxygen and other parameters that influence the waterbodies water quality. 72 samples will be collected per year for six stormwater runoff events, i.e., two per fall, winter, spring quarter.	The magnitude of aquatic life toxicity and its causes focusing on Ceriodaphnia toxicity and diazinon and chlorpyrifos will be assessed.	High priority - essential to characterizing impact of stormwater runoff on receiving water characteristics
Characterize Mosher Slough and Smith Canal water quality during dry weather.	Grab samples will be collected from Mosher Slough and Smith Canal during dry weather to determine magnitude of aquatic life toxicity and OP pesticide concentrations. Measurements w ill also be made of dissolved oxygen and other parameters that influence the waterbodies\rquote water quality. 48 samples will be collected with three sets of samples taken per quarter, including summer, over the year.	The presence of aquatic life toxicity to fathead minnow larvae and Selenastrum, as well as the concentrations of diazinon and chlorpyrifos, will be assessed during dry weather conditions to determine how stormwater runoff impacts aquatic life toxicity in Mosher Slough and Smith Canal.	High priority - It is necessary to characterize Mosher Slough and Smith Canal water quality during dry weather to determine the impact of the stormwater runoff on water quality
Pesticide export from residential properties.	Grab samples will be taken at the gutter of four different residential properties during stormwater runoff events to determine the amount of aquatic life toxicity and diazinon and chlorpyrifos in the stormwater runoff associated with specific applications of OP pesticides on the property. 144 samples will be collected per year.\cell The relationship between specific pesticide applications, such as use for termite and/or ant control, lawn and/or shrubbery pest control, and the export of the applied pesticides in stormwater runoff from the property will be determined.	High priority - The relationship between pesticide use on residential properties and the export of pesticides from these properties during stormwater runoff events is essential to focusing the public education program on those uses that contribute to stormwater runoff aquatic life toxicity.	

Toxic plume definition and impacts.	Grab samples will be taken in Mosher Slough and Smith Canal, as well as downstream of these waterbodies, to determine the fate, magnitude, areal extent, and duration of the aquatic life toxicity to Ceriodaphnia in the toxic plume developed by stormwater runoff events. Two stormwater runoff events for Mosher Slough and Smith Canal will be followed per year, with about 20 samples taken during each event. A total of about 100 samples will be collected in the plume definition studies. These studies will be coordinated with the bioassessment studies to determine the exposure that sensitive aquatic life are experiencing at various locations potentially impacted by the OP pesticide-caused toxicity in stormwater runoff.	The magnitude of toxic conditions will be assessed during and following stormwater runoff events. This information provides a basis for assessing the water quality impacts of OP pesti-cide-caused aquatic life toxicity on receiving water aquatic life-related beneficial uses.	High priority - The regulation of OP pesticide toxicity involving restrictions on labeled use requires that the restriction be based on a significant adverse impact to public health or the environment. This part of the project will provide the necessary information to link the Stockton stormwater runoff presence of laboratory-based toxicity test results to aquatic life resource impairment within the eastern Delta.
Special purpose studies.	Several special purpose studies will be conducted in which samples will be analyzed in support of the above components of the project. These include Toxicity Investigation Evaluations (TIE) and caged fathead minnow in-stream exposures. The number of samples analyzed will be dependent on the results obtained.	The TIEs will determine the cause of the toxicity, focusing on the OP pesticides diazinon and chlorpyrifos. If significant unknown-caused toxicity is found, then more comprehensive TIEs will be conducted to try to determine its cause. The caged fathead minnow studies will focus on determining the cause of the Stockton dry weather storm sewer discharge toxicity that kills fathead minnows exposed in cages in Mosher Slough near the point of discharge.	High priority - The TIE studies are essential to determining the cause of the toxicity. The caged fathead minnow toxicity studies need to be done to determine the cause and significance of the toxicity associated with Stockton storm sewer discharges during dry weather conditions.

SUMMARY: The aquatic life toxicity and OP pesticide occurrence, sources, persistence and impacts studies will involve the analysis of about 500 samples per year for aquatic life toxicity and OP pesticides. While the sampling program in the second and third year will be modified based on the first year's results, the total number of samples taken and analyzed will be about the same.

APPLICANT QUALIFICATIONS

Michael Lozeau, Esq., BayKeeper and Executive Director. J.D. Honors Rutgers University. For five years before he became Executive Director, Mike was General Counsel and Program Director for BayKeeper. He was previously Associate Attorney at Sierra Club Legal Defense Fund. For some years, he has also been a sole practitioner, specializing in Clean Water Act and Endangered Species litigation. As Executive Director, he has successfully expanded the BayKeeper program, introduced the first compressed natural gas boat to the West Coast, facilitated the creation of a West Coast Keeper Alliance, and acquired seed funds to start DeltaKeeper. He serves as the Chair of the Board for Friends of the Estuary.

Bill Jennings, DeltaKeeper. For the past decade, Bill Jennings has fought to protect the environment. He has served as Chairman of the California Sportfishing Alliance and the Committee to Save the Mokelumne River, working to preserve water quality in rivers flowing to the Sacramento-San Joaquin Delta. His efforts to save the Mokelumne led to the creation of DeltaKeeper. Since October of 1995, Bill has kicked off a highly successful program, including an important toxicity monitoring effort aimed at establishing baseline toxicity data at 12 sites on the San Joaquin River. Bill is widely respected by scientists, agency personnel, activists and others. Bill sits on numerous task forces and panels and works routinely to support the work of regulatory agency staff from the Central Valley Regional Water Quality Control Board.

Dr. G. Fred Lee, DEE, President, G. Fred Lee & Associates, El Macero, CA
Dr. Lee has over 39 years of professional experience in water quality evaluation and management. He pioneered in the investigation of urban area stormwater runoff water quality impacts in the 1960s and has be en active as a researcher and consultant in this area since that time. Dr Lee is active with the CA State Storm Water Quality Task Force where, during 1998, he chaired the Stormwater Science Work Group. He has a PhD in environmental engineering with emphasis on aquatic chemistry and water quality from Harvard University. For 30 years, until 1989, he held graduate-level university environmental engineering teaching and research positions where he conducted over $5 million in research devoted to water quaity evaluation and management issues and published over 500 professional papers and reports on this work. He has developed over 50 professional papers and reports devoted to urban area and highway stormwater runoff water quality impact evaluation and management. Dr Lee has established a web site, http://members.aol.com/gfredlee/gfl.htm, where he lists and makes available many of his papers and reports. He and Mr. Taylor, of RBF, have conducted a three-year Evaluation Monitoring study of aquatic life toxcity in the Upper Newport Bay Orange County watershed and its impacts on Upper Newport Bay water quality. This project has recently been expanded by the Santa Ana Regional Water Quality Control Board to collect the information needed on pesticide and tox icity sources in the Upper Newport Bay watershed to develop TMDLs for aquatic life toxicity, diazinon and chlorpyrifos by 2002.

Scott Taylor, Associate, Robert Bein, William Frost and Associates, Irvine, CA
Mr. Taylor holds the position of Director of Flood Control Engineering with RBF and has over 15 years of experience in hydrologic, hydraulic and flood control design. He has a masters

degree in civil and water resources engineering. He is a registered Professional Engineer and has extensive expeience in the design of regional and local flood control improvements associated with transportation and other public works projects. Mr Taylor chairs the State Storm Water Quality Task Force BMP Work Group. He is the RBF staff person responsible for con ducting a $3 million/yr, three-year Caltrans project that is evaluating the ability of conventional BMPs to treat highway stormwater runoff.

Dr. Anne Jones-Lee, Vice President, G. Fred Lee & Associates, El Macero, CA
Dr. Anne Jones-Lee has a bachelors degree in Biology from Southern Methodist University and a PhD degree from the University of Texas Dallas, focusing on aquatic toxicology/water quality. For eleven years she held university graduate level teaching/research positions in departments of environmental engineering and environmental sciences, where she taught aquatic biology and aquatic toxicology courses. She has published over 200 professional papers and reports. She and Dr. G. Fred Lee have worked together as a team since the mid 1970s.

Jim Harrington, Staff Water Quality Biologist, California Dept. of Fish and Game, Water Pollution Control Laboratory

Jim Harrington has been an aquatic biologist for 20 years. He worked for the National Park Service in northern California for eight years prior to working for CDFG. Jim has worked for CDFG since 1987 and is currently assigned to the Water Pollution Control Laboratory1 (WPCL) which is part of the Office of Spill Prevention and Response (OSPR).

Jim graduated from Humboldt State University in 1979 with a Bachelors of Science in Fisheries Management and in 1983 with a Masters of Science in Watershed Management. His graduate work emphasis was water quality of wildland streams and for his theses, he developed an analytical technique for monitoring changes in the benthic macroinvertebrate communities of second-order streams affected by clear-cut logging. As Staff Water Quality Biologist for the WPCL, Jim designs and conducts monitoring programs throughout California. Currently, Jim is involved with developing rapid bioassessment protocols for California, organizing the California Aquatic Bioassessment Workgroup and designing and conducting bioassessment investigations of point and non-point sources of pollution and enforcement of Fish and Game Code 5650.

The CDFG Water Pollution Control Laboratory (WPCL) uses various chemical and biological techniques to assess status, damage and monitor recovery of aquatic systems. Some of these techniques include analytical chemical analysis, field water quality determinations, aquatic toxicity testing, stream gravel quality assessment, aquatic habitat measurement and aquatic biota surveys including benthic macroinvertebrate. WPCL provides technical support to all CDFG functions and many branches of State and Federal government which deal in environmental monitoring and regulation.

REFERENCES:

Giesy, J.P., Solomon, K.R., Coates, J.R., Dixon, K.R., Giddings, J.M., and Kenaga, E.E., Chlorpyrifos: Ecological Risk Assessment in North American Aquatic Environments, In: Ware, G.W. (ed), Reviews of Environmental Contamination and Toxicology, 160:1-129, Springer-Verlag, New York, NY, (1999).

Lee, G.F. and Jones, R.A., An Approach for Evaluating the Potential Significance of Chemical Contaminants in Aquatic Habitat Assessment, Proc. of Symposium, Acquisition and Utilization of Aquatic Habitat Inventory Information, American Fisheries Society, pp. 294-302, (1982).

Lee, G.F. and Jones-Lee, A., Conclusions from Review of the City of Stockton's Urban Stormwater Runoff Aquatic Life Toxicity Studies Conducted by the CVRWQCB, DeltaKeeper and the University of California, Davis Aquatic Toxicology Laboratory between 1994 and 1997, Report of G. Fred Lee & Associates, El Macero, CA, April (1999).

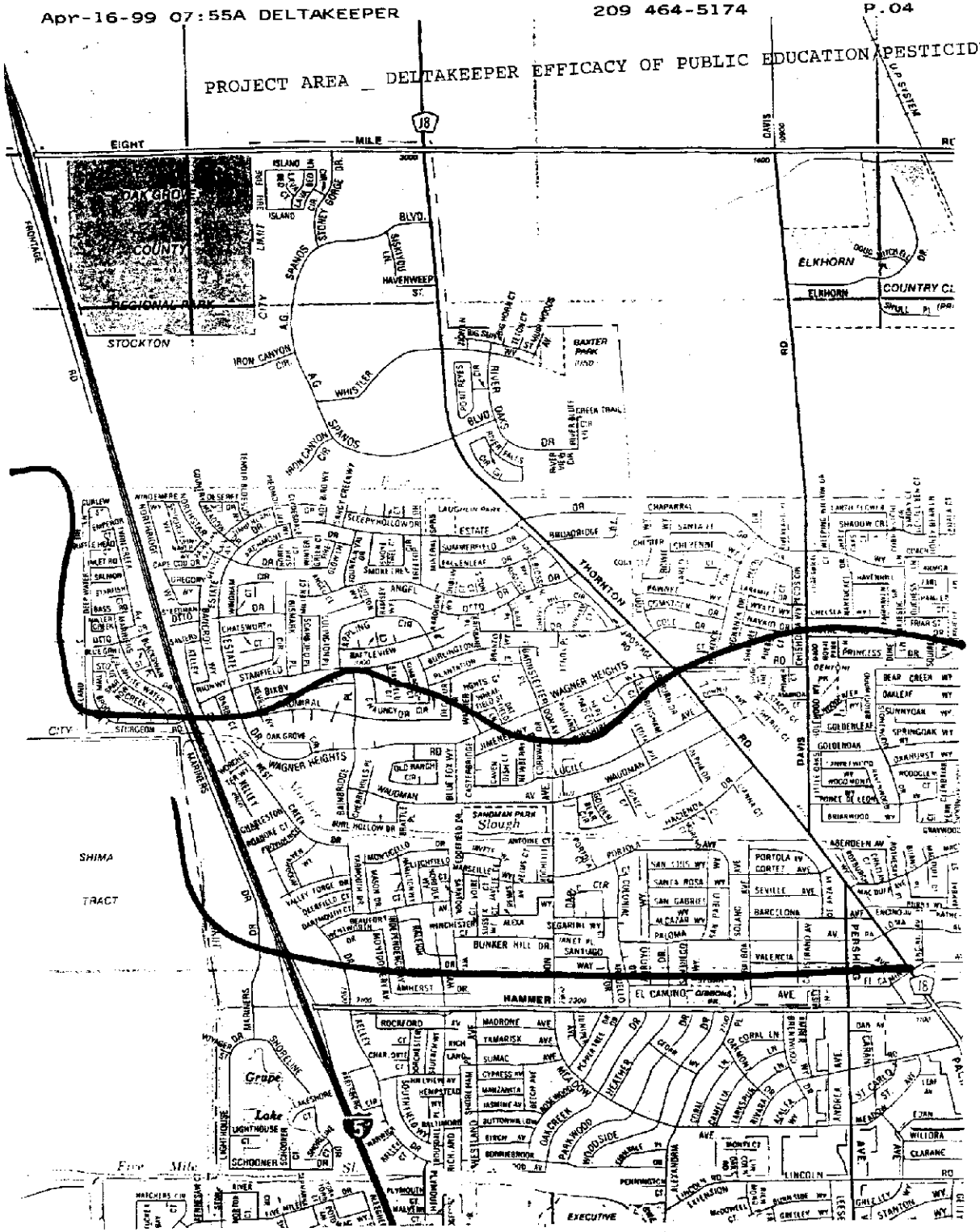
Lee, G.F., Jones-Lee, A., Taylor, S., and Neiter, D., Evaluation of the Water Quality Significance of OP Pesticide Toxicity in Tributaries of Upper Newport Bay, Orange County, CA, Environmental Toxicology and Risk Assessment: Recent Achievements in Environmental Fate and Transport: Ninth Volume, ASTM STP 1381, American Society for Testing and Materials, West Conshohocken, PA, (1999a).

Lee, G.F., Taylor, S. and Neiter, D., Review of Existing Water Quality Characteristics of Upper Newport Bay, Orange County CA and its Watershed and Results of Aquatic Life Toxicity Studies Conducted During 1997-98 in the Upper Newport Bay Watershed, Report of G. Fred Lee & Associates, El Macero, CA, Submitted to State Water Resources Control Board, Sacramento, CA; Santa Ana Regional Water Quality Control Board, Riverside, CA; and Orange County Public Facilities and Resources Department, Santa Ana, CA, 210 pp., (1999b).

Lewis, P.A., Klemm, D.J., Lazorchack, J.M., Norberg-King, T., Peltier, W.H. and Heber, M.A., Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Environmental Monitoring Systems Laboratory, Cincinnati, OH; Environmental Research Laboratory, Duluth, MN; Region 4, Environmental Services Division, Athens, GA; Office of Water, Washington, D.C.; Environmental Monitoring Systems Laboratory, Cincinnati, OH; Office of Research and Development, US Environmental Protection Agency, Cincinnati, OH, (1994).

Novartis, An Ecological Risk Assessment of Diazinon in the Sacramento and San Joaquin River Basins, Novartis Crop Protection, Inc., Technical Report: 11/97, Greensboro, NC, (1997).

PROJECT AREA _ DELTAKEEPER EFFICACY OF PUBLIC EDUCATION PESTICIDES



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DELTAKEEPER - EFFICACY OF PUBLIC EDUCATION ON PESTIDE REDUCTION

PROPOSAL #1

TOTAL COSTS - 3 YEAR PROJECT

TASK	DIRECT LABOR HOURS	DIRECT SALARY & BENEFITS	SERVICE CONTRACTS	MATERIAL AND ACQUISITION COSTS	MISCELLAN AND OTHER DIRECT COSTS	OVERHEAD AND OTHER DIRECT COSTS	TOTAL COST
TASK 1		$0	$1,032,000	$0	$75,000	$77,875	$1,184,875
TASK 2	$10,890	$146,700	$18,000	$39,000	$12,870	$30,900	$247,470
TASK 3			$240,912		$0		$240,912
TOTAL PROJECT COST							1673257

QUARTERLY BUDGET

TASK	QUARTRLY BUDGET 1/00-3/00	QUARTRLY BUDGET 4/00-6/00	QUARTRLY BUDGET 7/00-9/00	QUARTRLY BUDGET 10/00-12/00	QUARTRLY BUDGET 1/01-3/01	QUARTRLY BUDGET 4/01-6/01	QUARTRLY BUDGET 7/01-9/01	QUARTRLY BUDGET 10/01-12/01	QUARTRLY BUDGET 1/02-3/02	QUARTRLY BUDGET 4/02-6/02	QUARTRLY BUDGET 7/02-9/02	QUARTRLY BUDGET 10/02-12/02	TOTAL COST
TASK 1	$118,487	$118,487	$39,495	$118,487	$118,487	$118,488	$39,496	$118,488	$118,488	$118,488	$39,496	$118,488	$1,184,875
TASK 2	$24,747	$24,747	$8,249	$24,747	$24,747	$24,747	$8,249	$24,747	$24,747	$24,747	$8,249	$24,747	$247,470
TASK 3	$24,091	$24,091	$8,031	$24,091	$24,091	$24,091	$8,031	$24,091	$24,091	$24,091	$8,031	$24,091	$240,912
TOTALS	$167,325	$167,325	$55,775	$167,325	$167,325	$167,326	$55,776	$167,326	$167,326	$167,326	$55,776	$167,326	$1,673,257
TOTALS													

COST SHARING	MATCH PROJECTED
G. Fred Lee and Associates	$91,000
BayKeeper/DeltaK Staff time	$30,764
DeltaKeeper Volunteer Hours	$45,000
DeltaKeeper Hard Costs, Materials/other	$16,075
Possible additional grant funds	$40,000
	$222,839

Matching amounts are projections of expected grant funds, BayKeeper operating support to be provided volunteer hours needed for the project, and committed hours from contractors

Other funds may be forthcoming as BayKeeper raises grant funds for expansions of the public education component of this project.

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